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SUBSTITUTE SPECIFICATION

[0001] MODULAR UNIT COMPRISING A BUSH FOR CHAIN DRIVES

[0002] BACKGROUND

[0003] The invention relates to a modular unit comprising a metal bushing, which is inserted into a plastic supporting body for a tensioning rail or a guiding rail of a chain drive of an internal combustion engine and mounted to the engine by way of a screw passing through the bushing, contacting it axially.

[0004] In order to mount plastic tensioning rail or guiding rails for chain drives either fixing screws or bushings are used, with the bushings being pressed into the plastic supporting body or sunk in using an ultrasound process. This is necessary because of the fact that without the bushing the plastic would flow under the load of the screw and the screw could no longer provide any preload. Consequently, it would release during operation. For tensioning rails, usually a screw is used with its exterior diameter being smooth, and on which the rail can pivot without much wear.

[0005] In order for the known bushings to remain in their position in the supporting bodies of guiding rails, frequently knurls are arranged at their exterior diameters in an expensive fashion. A preliminary assembly of the screws for the tensioning rail is hardly possible. Another problem arises in guiding rails having two or more mounting positions. Here, at least one of the mounting positions is provided in the form of an oblong hole or an oversized bore in order to compensate for component tolerances and heat expansion. This reduces the precision of the positioning of the rail.

[0006] From publication DE 43 41 019 A1 a modular unit of the above-mentioned type is known, which has the disadvantage that the bushings are required in two differently constructed versions, i.e. one metal bushing for the support of the tensioning rail and one mounting bushing for a guiding rail.

[0007] SUMMARY

[0008] The invention is based on the object to develop a bushing, which can be used both in tensioning rails as well as in guiding rails. Here, several bushings of identical design are to be used so that it is possible, e.g., to allocate one bushing in a primary mounting hole, formed as a bore, and to allocate another identically designed bushing in an oblong hole. Additionally, such an identically designed bushing should be suitable for the pivotal support of a tensioning rail. The bushing should be of simple production and additionally should secure the rails in the direction of the axis of the bushing. Commonly standard screws are to be used for mounting the rails. Furthermore, the bushing is to be designed such that the possibility of faulty assembly is excluded.

[0009] This object is attained according to the invention due to the bushing being provided as a rotationally symmetrical body, inserted into a mounting hole of the supporting body, with its end section facing the motor being provided with a circular step for the transition to a reduced exterior diameter, by which it is axially held to a step provided on the inside of the mounting hole of the supporting body with a reduced interior diameter. Such a bushing can be used in numerous applications and components due to its simple design, so that the numbers to be produced can be respectively large. The bushings are clamped into the support body of the rails, their assembly is therefore possible without any great expense. No additional tension is applied into the plastic component in the embodiment according to the invention, as e.g. occurring in force-fitted bushings.

[0010] BRIEF DESCRIPTION OF THE DRAWINGS

[0011] An exemplary embodiment of the invention is shown in the drawing and will be explained in greater detail in the following. Shown are:

[0012] Figure 1 a perspective view of a guiding rail having two mounting holes and a bushing and a screw, above each mounting hole, in an exploded view;

[0013] Figure 2 an enlarged section of the guiding rail having a mounting hole provided as an elongated hole and a bushing inserted therein;

[0014] Figure 3 a cross-section through the mounting area of a tensioning rail at a motor housing.

[0015] Figure 4 a part of a guiding rail according to Figure 1, shown in section taken along a plane extending through the axes of the bushings.

[0016] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] A bushing 1 is provided formed as a rotationally symmetrical body. In the axial direction, a through bore for a mounting screw 2 is located in the center of the bushing 1. The bushing 1 serves to mount a supporting body 3 for a guiding rail or tensioning rail 4 to a motor housing 5. The supporting body is provided with a primary mounting hole, formed as a reference bore 6, and a secondary mounting hole, formed as an oblong hole 7, that is spaced apart therefrom. As clearly discernible from Figures 1 and 4, the guiding rail 4 is provided with two mounting holes, with one bushing 1 being provided for each mounting hole. Here, the bushing 1 for the reference bore 6 and the bushing 1 for the oblong hole 7 are formed with an identical design. The bushing 1, which is located in the oblong hole 7, can be shifted parallel to its axis in a displacement direction 8. A minimal clearance 9 is present between the bushing 1 and the oblong hole 7 laterally to the displacement direction 8. The through bore of the bushing 1 may also be provided with a minimal clearance in reference to the screw 2. This considerably improves the tolerance situation with respect to the prior known solutions.

[0018] In the end region of the bushing 1, one circular step 10 is provided for the transfer to a reduced exterior diameter. The step is used in cooperation with the supporting body 3 of the tensioning rail 4 shown in Figure 3 such that it is held during the screw-on process at the support body 3 at a step 11 formed in the mounting hole. In reference to the supporting body 3, the bushing 1 maintains a slight gap 12, so that the rail always remains pivotal. This design of the contour ensures the rail to be positioned in the axial direction of the motor. A minimum gap is also possible between the screw 2 and the bore of the bushing 1.

[0019] Furthermore, at the exterior diameter of the bushing 1, a groove 13 is provided in the form of a cut. This cut is advantageously located off-centered, so that the bushing 1 cannot be mounted in the wrong direction.

[0020] In each bore section of the supporting body 3 for the rail, one small bead 14 is provided formed at the wall, which partially reduces the diameter of the bore. Instead of a continuous bead 14, individual bead sections may be provided as well. The bead 14 engages the groove 13 of the bushing 1 when the bushing 1 is inserted into the mounting hole of the supporting body 3. In this manner the bushing 1 is protected from falling out during transport. The width of the cut is to be selected such that the bead 14 is positioned openly in the grove 13 when assembled.

[0021] In order to ensure the freedom of movement for the supporting body 3 and the tensioning rail 4, the bushing 1 is provided at its axial end with protrusions 15 and 16, so that it protrudes beyond the length of the component of the support body 3 in the area of the mounting hole. When the bushing 1 is used at the guiding rail 4, the step 11 is formed such that the step 10 of the bushing 1 ensures play-free support body 3 at the motor housing 5.

[0022] In oblong holes in the support bodies 3 of guiding rails 4, a small bead 14 may also be provided as a protrusion at the wall in the longitudinal direction of such a mounting hole. After the bushing 1 has been clamped in, it can be freely displaced in the longitudinal direction of the oblong hole 7, i.e. axially parallel in reference to the bushing, until it is aligned with the bore for the screw 2 in the motor block 5. Due to the fact that the bore of the bushing 1 is only slightly larger than the gap of the screw 2, and additionally the bushing 1 has snapped into the support body 3 of the guiding rail 4, additional positioning tolerances may be reduced here. Here, it is also to be observed: If the bushing 1 is screwed on the step 10 jams the step 11 in the plastic of the support body 3 of the rail so that a secure fixation is ensured.

[0023] Due to the fact that the bushing 1 according to the invention concerns a rotationally symmetrical component without any protrusions, its exterior diameter may be cut without any center. This is considerably more efficient than the insertion cuts of collar screws. This advantage may be used particularly for tensioning rails.

[0024] The assembly of the bushing 1 can occur using simple assembly devices, e.g., a hand lever press. Compared thereto, expensive machines are necessary for an insertion using the ultrasound process. Additionally, the ultrasound process requires a large amount of energy.

[0025] When using the bushing 1 at the tension rails 4, the step 11 of the support body 3 is provided such that between the support body 3 and the motor housing 5 some clearance is provided. In this case, play develops between the head of the mounting screw 2 and the support body 3, as discernible from Figure 3, so that the rail is pivotal.

[0026] When using the bushing 1 at the guiding rail 4, the step 11 of the support body 3 is advantageously provided such that it can be jammed to the motor housing 5 by the step 10 of the bushing 1.

[0027] Identically designed bushings may also be used for a tensioning rail and for a guiding rail. The bushings are clamped to the rails and remain there. The bead and the groove are embodied such that the bushing preliminarily mounted in the support body can be moved freely due to the clearance in the bead / groove arrangement. Prior to the assembly no axial fixation of the rail at the motor housing occurs, this arrangement serves merely for transportation safety. By the embodiment of the bushing according to the invention a best-fitting shape and a high surface quality can be guaranteed. The bushings are completely covered by the rail body.

List of Reference Characters

1	bushing
2	mounting screw
3	supporting body
4	guiding rail or tensioning rail
5	motor housing, motor block
6	reference bore
7	oblong hole
8	direction of displacement
9	minimum clearance
10	step
11	stop
12	gap
13	groove
14	bead
15	protrusion
16	protrusion